

REMARKS

Applicants request favorable reconsideration and withdrawal of the objection and rejections set forth in the above-mentioned Office Action in view of the foregoing amendments and the following remarks.

Initially, the Office Action objects to the drawings of the application. Specifically, the Office Action asserts that the drawings do not show every feature of the claimed invention, and in particular, do not show a plurality of sensors, each with its own separate waveguide, detection portion, and protrusions. The Office Action concludes, therefore, that such features of the invention must be shown or cancelled from the claims.

In response, Applicants note that the claim language has been amended herein, thereby obviating some of the objection to the drawings. Applicants further, note, however, that originally-filed Figure 20 of the application illustrates an array with a plurality of sensors. Thus, to the extent that the Office Action objects to the drawings not showing the features related to a plurality of sensors, Applicants traverse the objection on the basis of Figure 20.

The Office Action further asserts that an inkjet system is not shown in the drawings.

In repose, Applicants are submitting a new drawing sheet with new Figure 23. This new figure illustrates an ink jet 2301 in relation a sensor. The specification of the application has been correspondingly amended to provide a description of this figure. Applicants submit that the new figure and amendments to the specification do not include new matter inasmuch as an ink jet

system is clearly described in the originally-filed disclosure (see e.g., page 29, line 26 - page 21, line 11), and the sensor shown in relation to the ink jet 2301 in the new figure is both described and illustrated in the originally-filed disclosure.

Accordingly, for at least the foregoing reasons, Applicants submit that the objection to the drawings have been overcome and should be withdrawn.

Claims 1, 5-10, and 15-17 are now pending in the application, with claims 1 and 17 being independent claims. Claims 8 and 9 stand withdrawn from further consideration as being directed to a non-elected invention. Claims 12-14 have been cancelled without prejudice or disclaimer of subject matter. Claims 15-17 are new. Claims 1, 5, and 6 have been amended. Support for the new claims and amendments can be found throughout the originally-filed disclosure, including, for example, in Figures 1, 2, and 20; page 14, lines 17-24; page 15, line 13 through page 16, line 1; Example 2 beginning at page 23, line 20; and Example 3 beginning at page 28, line 10, of the specification. Accordingly, Applicants submit that the new claims and amendments do not include new matter.

Claims 1, 5-7, and 10 are rejected in the Office Action under 35 U.S.C. § 103(a) as being unpatentable over “Integrated THz Technology for Label-Free Genetic Diagnostics” to Nagel et al. (hereinafter “Nagel et al. 2002”) in view of “Three-Dimensional Polymer/Metal Based Resonators for THz-biosensing” to Nagel et al. (hereinafter “Nagel et al. 2004”) or Japanese Patent Publication No. 2001-074647 (Negami et al.). Claims 11-14 are rejected under 35 U.S.C.

§ 103(a) as being unpatentable over U.S. Patent Application Pub. No. 6,078,705 (Neuschäfer et al.).

Applicants respectfully traverse the rejections. Nevertheless, in order to expedite prosecution, Applicants have amended the claims to clarify certain features of the invention not disclosed or suggested by the cited references. To this end, Applicants submit that the claimed invention is patentably distinguishable from the cited references for at least the following reasons.

Independent Claim 1

Amended independent claim 1 recites a sensor comprising a waveguide, with the waveguide including a substrate and a conductor provided on the substrate. The waveguide further comprises a plurality of protrusions provided on the conductor, with the plurality of protrusions provided in a propagation direction of the electromagnetic wave and provided periodically at an interval which is about a half of a wavelength of the electromagnetic wave.

The Office Action cites Nagel et al. 2002 and Nagel et al. 2004 as one combination suggesting the features of the invention.

In Applicants' view, Nagel et al. 2002 discloses a resonator that can be used to analyze a DNA sample. The device includes three parallel-coupled microstrip line resonators configured by sandwiching benzocyclobutene (BCB) by conductors. See Figure 1 and its corresponding description at page 154. On the other hand, Nagel et al. 2004 discloses a parallel-plate

waveguide configured by sandwiching polyester (PET) film by two silicon wafers metalized with Au. See Figure 1 and its description at page 819. Further, in device of Nagel et al. 2004, periodic grooves are provided in order to allow the device to function as a resonator by providing a configuration that acts like a Bragg-reflector.

In setting forth the rejection with the combination of Nagel et al. 2002 and Nagel et al. 2004, the Office Action equates the grooves in Nagel et al. 2004 to “protrusions,” and asserts that it would have been obvious to modify Nagel et al. 2002 with the grooves of Nagel et al. 2004. Applicants respectfully traverse this logic, however, and submit that the two references are configured so differently, that one of ordinary skill in the art would not look to somehow combine them in the manner to result in the claimed invention. As noted above, Nagel et al. 2002 uses microstrip lines as conductors in order to form a resonator, whereas, Nagel et al. 2004 uses a grooved substrate which acts like a Bragg reflector in order to form a resonator. It simply would not make any sense for one of ordinary skill in the art to incorporate the grooves of Nagel et al. 2004 into the structure of Nagel et al. 2002, as the grooves would not aid in the resonating function: the structure of Nagel et al. 2002 does not function utilizing a Bragg reflector effect. Nor is there any apparent way that the structure of Nagel et al. 2002 could utilize a Bragg reflector effect with its thin film microstrip configuration. Moreover, the resonating function from the thin film microstrip lines of Nagel et al. 2002 would not be enhanced with the addition of any sort of groove, and if anything, the addition of a groove might destroy the function of the

apparatus if the thin lines are too broken. In other words, the device of Nagel et al. 2002 achieves its resonating function in a manner not in any way like that of Nagel et al. 2004, as such that there would be no motivation or reason for one of ordinary skill in the art to combine the references in the manner set forth in the Office Action.

The Office Action also cites the combination of Nagel et al. 2002 and Negami suggesting the features of the invention.

In Applicants' view, Negami et al. discloses, with reference to Figure 4 and paragraph 0035, the formation of a thin metal film 6 on a surface of an optical waveguide 3. The thin metal film 6 functions as a SPR sensor. Negami et al. also discloses that a dielectric film 8 is formed on the thin metal film 6 in order to fix an antigen or the like. In another embodiment depicted in Figure 8 and described at paragraph 0046 of Negami et al., a plurality of analyte holding portions 67 are provided in a direction perpendicular to a light propagation direction, with the thin metal film being provided on the analyte holding portions. Negami et al. notes that the configuration also for multiple samples to be analyzed promptly. See paragraph 0042.

With this configuration of Negami et al. in mind, Applicants submit that the combination of this reference with Nagel et al. 2002 would not suggest the features of the present invention to one of ordinary skill in the art. At most, Negami et al. could be taken to suggest a plurality of analyte holding portions formed in a direction perpendicular to a light propagation direction. Hence, assuming that one of ordinary skill in the art would look to include the plurality of analyte

holding portions disclosed by Negami et al. in the configuration of Nagel et al. 2002, the analyte holding portions would apparently be provided perpendicular to the light propagation direction in order to realize the Negami et al.'s noted effect of analyzing multiple samples at one time. Such a configuration, however, would clearly not result in a plurality of protrusions provided in a propagation direction of an electromagnetic wave, as recited in amended independent claim 1.

The Office Action also cites Neuschäfer et al. as disclosing features of the invention.

Initially, Applicants note, however, that Neuschäfer et al. does not appear to disclose (and the Office Action does not assert) a substrate and conductor as recited in amended independent claim 1. For this reason alone, Applicants submit that Neuschäfer et al. cannot be understood to disclose or suggest the invention recited in amended independent claim 1.

In Applicants view, Neuschäfer et al. discloses a sensor that uses light propagating through a sensor platform for sensing of a sample disposed in a sample space 12 using an electromagnetic wave with a frequency band in the visible region. See, e.g., Figure 6; col. 16, lines 11-33; and col. 19, line 49 through col. 20, line 5. A diffraction grating 3 for coupling-in of light from a diode laser 13 to the sensor platform 8 and a diffraction grating 3' of coupling-out of light which has propagated through the sensor platform 8 are respectively provided on the sensor platform 8. In view of this configuration, Applicants submit that, contrary to the assertion in the Office Action, the diffraction grating of Neuschäfer et al. cannot be equated to the plurality of protrusions recited in amended independent claim 1. There is no disclosure in Neuschäfer et al.

of the disposition of the diffraction grating with respect to the propagation direction of light or a sample object. A such, Neuschäfer et al. cannot be taken to disclose or suggest a plurality of protrusions provided on a conductor, in a propagation direction of an electromagnetic wave, and on each of which an object can be disposed, as recited in amended independent claim 1.

Thus, for at least the foregoing reasons, Applicants submit that the cited references to Nagel et al. 2002, Nagel et al. 2004, Negami et al., and Neuschäfer et al., whether taken individually or collectively, fail to disclose or suggest the combination of features recited in amended independent claim 1.

Independent Claim 17

New independent claim 17 recites a sensing apparatus that comprises, inter alia, a coplanar waveguide comprising a substrate, with a conductor being provided on a substrate. Further a ground conductor is provided on the substrate so as to form a minute gap between the conductor and the ground conductor, and the conductor and ground conductor are formed on the same surface of the substrate.

Applicants respectfully submit that the references cited in the Office Action, whether taken individually or collectively, fail to disclose or suggest the combination of features recited in new independent claim 17. That is, none of Nagel et al. 2002, Nagel et al. 2004, Negami, and Neuschäfer et al. discloses or suggests a sensing apparatus with a conductor and ground

conductor disposed on the same surface of a substrate, in combination with the other features recited in new independent claim 17.

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For at least the foregoing reasons, Applicants submit that the references cited in the Office Action fail to disclose or suggest the invention recited in amended independent claim 1 and new independent claim 17.

The dependent claims should also be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in the independent claims. Applicant requests further individual consideration of these dependent claims.

In view of the foregoing amendments and remarks, it is respectfully submitted that the pending claims are allowable over the references of record, and that the application is in condition for allowance. Favorable reconsideration and early passage to issue of the application are earnestly solicited.

Applicants' undersigned attorney may be reached in the Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to the below listed address.

Respectfully submitted,

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